MEMS Skin Friction Sensor, Phase I

Completed Technology Project (2011 - 2011)

Project Introduction

Interdisciplinary Consulting Corporation proposes a sensor that offers the unique capability to make non-intrusive, direct, simultaneous mean and fluctuating shear stress measurement for subsonic and transonic test applications. Currently a standard for shear stress measurement tool does not exist. A precise silicon micromachined, differential capacitive, instrumentation grade sensor will facilitate skin friction measurement with high bandwidth, high resolution, and minimal sensitivity to pressure. The proposed sensor possesses through wafer vias for backside electrical contacts to enable non-intrusive measurements in turbulent boundary layers. A robust and compact package with miniature interface electronics enables flush sensor mounting conformal with surfaces. The sensor development effort transitions a proof-of-concept device by adding design components to have reduced pressure sensitivity to result in a commercially viable product. Circuit topology development for biasing and signal conditioning provides the ability to make simultaneous mean and dynamic shear stress measurement. The sensor performance will exceed its predecessors and set the standard for quantitative skin friction measurements. The simplicity of sensor design and an equally simple and proven fabrication technique allows for low cost, high performance sensors. The sensor holds promise to transform current flow control techniques and enable efficient aerodynamic designs. Existing shear stress estimation techniques rely on known correlation to a measured quantity. Direct measurement eliminates the need for a known correlation in an unknown flow. Capacitive transduction has been successful for a highly sensitive device with a large dynamic range and low noise floor, which is the current state of the art. The proposed sensor may therefore be improved beyond the state of the art to serve as a measurement standard for all types of skin friction measurement techniques.

MEMS Skin Friction Sensor, Phase I

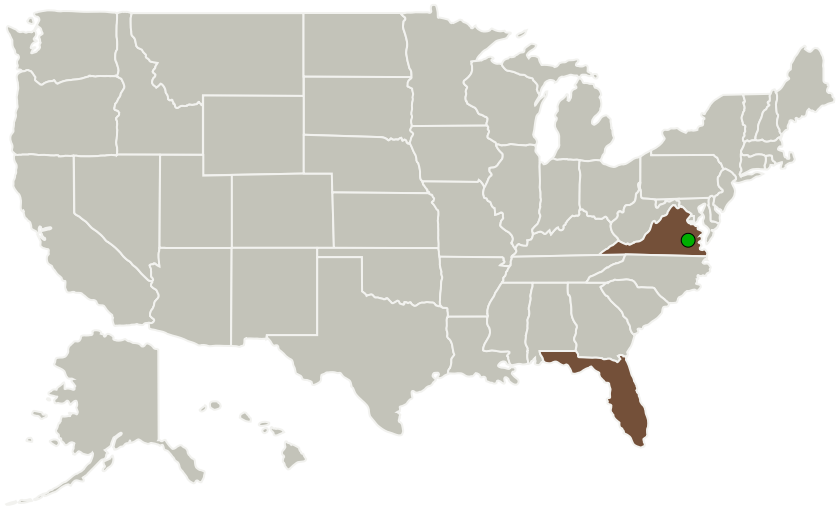
Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

MEMS Skin Friction Sensor, Phase I

Completed Technology Project (2011 - 2011)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Interdisciplinary Consulting Corporation	Lead Organization	Industry	Gainesville, Florida
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Florida	Virginia

Project Transitions

February 2011: Project Start

September 2011: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140179)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Interdisciplinary Consulting Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

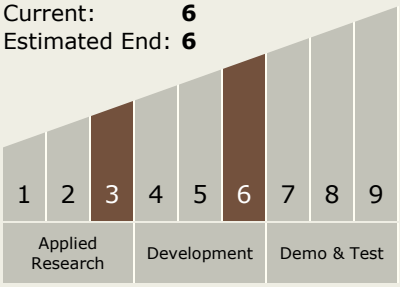
Carlos Torrez

Principal Investigator:

Benjamin Griffin

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



MEMS Skin Friction Sensor, Phase I

Completed Technology Project (2011 - 2011)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.1 Aerodynamics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System